



COLLEGE OF  
INTEGRATIVE MEDICINE™

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## Integrative Medicine Approach to Hypertension

*(Adapted from College of Integrative Medicine Module 14 – Integrative Cardiology)*

Dr. Wayne Sodano DC, DABCI, DACBN, CFMP, BCTN



*Image by: www.aopa.org*

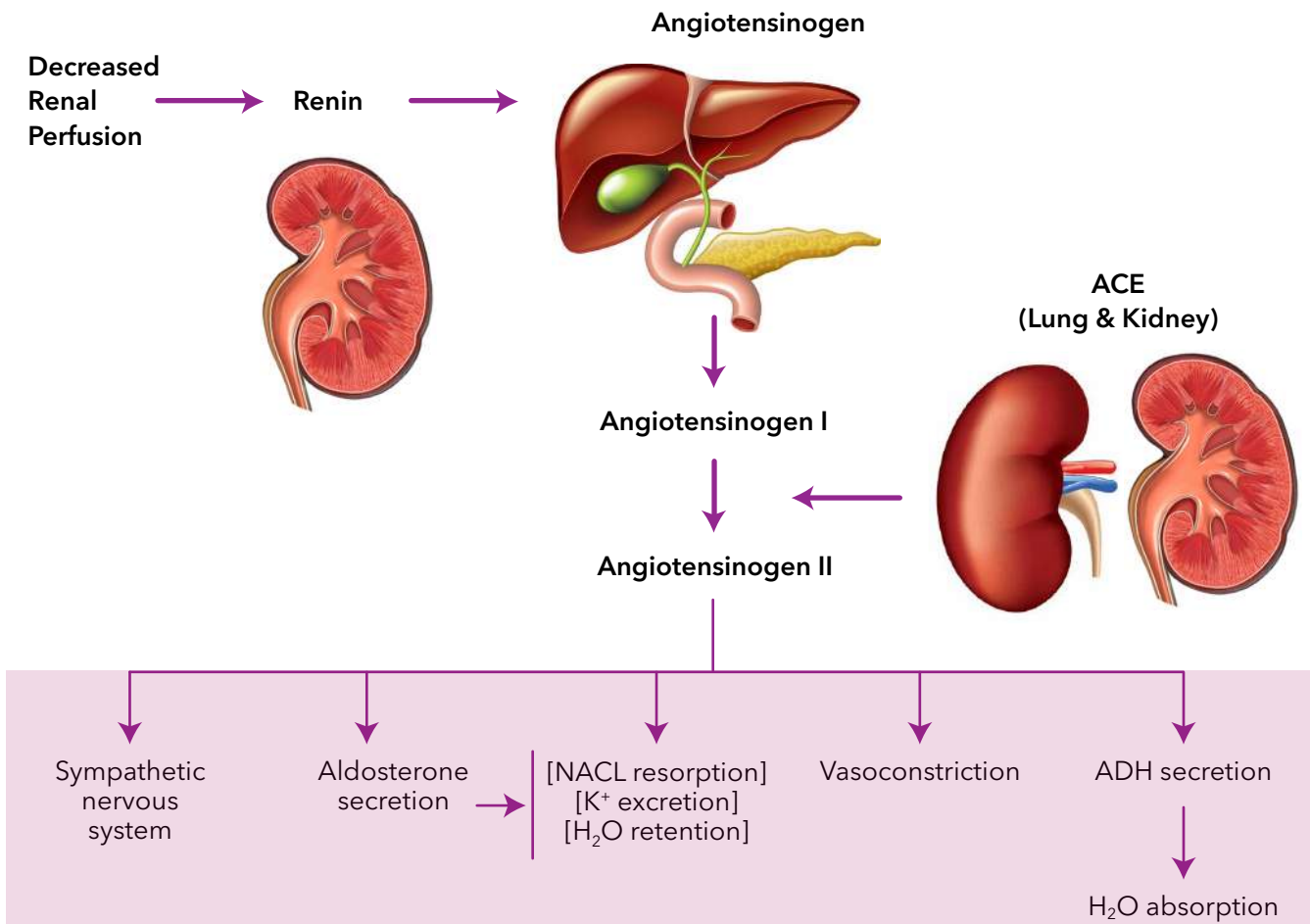
"Hypertension is a consequence of the interaction of genetics and environments.<sup>1</sup> Essential hypertension largely results from various lifestyle abuses. Factors leading to glucose intolerance, hyperinsulinemia, oxidative stress, environmental toxins (especially heavy metals), autoimmune dysfunction, atherosclerosis, obesity, and nutritional deficiencies seem to coalesce to produce hypertension. Several of these factors lead to endothelial dysfunction that can initiate and perpetuate essential hypertension. The target organ disease of hypertension includes: the heart (myocardial infarction), cerebrovascular (TIAs, stroke, dementia), peripheral vascular disease (claudication), retinopathy, and renal disease.

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Systolic pressure is governed by cardiac action, the elasticity and distensibility of the conducting arteries, loss of distensibility (i.e. arteriosclerosis). The resistance or tone of the arterioles and blood viscosity maintains diastolic pressure. The kidneys also play a powerful role in regulating arterial pressure via the renin-angiotensin-aldosterone system (RAAS). "RAAS is a hormonal cascade that functions in the homeostatic control of arterial pressure, tissue perfusion, and extracellular volume. Dysfunction of the RAAS plays an important role in pathogenesis of cardiovascular and renal disorders."<sup>1</sup> Renin is a proteolytic enzyme produced and released by the kidneys when arterial pressure falls too low. Renin acts enzymatically on the plasma protein, angiotensinogen, which is converted to angiotensin I, a mild vasoconstrictor. As angiotensin I follows through the lungs, it is acted upon by the enzyme angiotensin-converting enzyme (ACE), and converted to angiotensin II, a powerful vasoconstrictor.



"For the past century, the renin-angiotensin system (RAS) has been recognized as one of the major blood pressure regulating systems. Angiotensin II is the physiologically active product of RAS, and it works not only as a strong vasopressor but also as a promoter of tissue remodeling in various organs such as heart, arteries, and kidneys. RAS is the predominate pathway of angiotensin II (Ang II) formation in human plasma, but not in the tissues. There are several alternative pathways producing angiotensin II in human tissues

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and they are involved in structural remodeling of the cardiovascular systems.”<sup>iii</sup> “RAAS plays a critical role in initiation and maintenance of vascular inflammation and vascular remodeling. Vascular inflammation leads to endothelial dysfunction, and decreased endothelial function mediates progression of cardiovascular disease.”<sup>iv</sup> “There is increasing evidence indicating a link between hypertension and atherosclerosis via Ang II mediated inflammation. In vivo, acute treatment with Ang II significantly increases leukocyte adhesion in the rat mesenteric arteries. Animal and human studies show that Ang II has pro-inflammatory responses in arteries, heart, and kidney by regulating the expression of cytokines and chemokines. In human vascular smooth muscle cells, Ang II induced NF-κB activation and the expression of IL-6, MCP-1 and TNFα in monocytes.”<sup>v</sup>

## Hormone and Other Chemical Messengers That Effect Blood Pressure

<b>1</b>	Epinephrine and norepinephrine	<ul style="list-style-type: none"> <li>Released by the adrenal glands in response to stress; increase cardiac output and constrict arterioles</li> </ul>
<b>2</b>	Aldosterone	<ul style="list-style-type: none"> <li>Released by the adrenal glands as prompted by angiotensin II; causes water and salt retention</li> </ul>
<b>3</b>	Antidiuretic Hormone	<ul style="list-style-type: none"> <li>Produced by the pituitary when blood pressure is very low; causes water retention and constricts arterioles</li> </ul>
<b>4</b>	Nitric Oxide	<ul style="list-style-type: none"> <li>Released by the lining of the endothelial cells of the arteries; relaxes blood vessels and improves blood flow</li> </ul>

## Classification of Hypertension

Based on the recommendations of the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and treatment of High Blood pressure (JNC 7), the classification of blood pressure for adults aged 18 and older is represented in the table below:

CLASSIFICATION	SYSTOLIC BLOOD PRESSURE (MMHG)		DIASTOLIC BLOOD PRESSURE (MMHG)
<b>NORMAL</b>	< 120	and	< 80
<b>PREHYPERTENSION</b>	120 - 139	or	80 - 89
<b>STAGE 1 HYPERTENSION</b>	140 - 159	or	90 - 99
<b>STAGE 2 HYPERTENSION</b>	≥ 160	or	≥ 100

(2014 Evidence-Based Guideline for Management of High Blood Pressure in Adults: Report from the Panel Members Appointed to the Eight Joint National Committee [JNC 8] with Hypertension Guideline Management)

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Although primary hypertension accounts for over 90% of the etiology, secondary causes of hypertension should be considered. Common causes of secondary hypertension include kidney disease, renovascular disease, prescription medications and illicit drugs, coarctation of the aorta, pheochromocytoma, primary aldosteronism, thyroid disease, and parathyroid disease.

## Drugs Commonly Linked to Hypertension<sup>vi</sup>

	DRUG CLASS	DRUG NAME	MECHANISM OF ACTION
✓	Sympathomimetic Agents	amphetamines phenylpropanolamine, ephedrine, pseudoephedrine	Increase levels of norepinephrine and the subsequent potentiation of noradrenergic neurotransmission
✓	NSAIDs and COX-2 Inhibitors	ibuprofen, diclofenac, Celecoxib	Block COX - 1 and COX - 2 enzymes, which leads to reduction in prostaglandin formation; water and sodium retention.
✓	Corticosteroids	Prednisone, fludrocortisone, hydrocortisone	Sodium and fluid retention
✓	CNS Stimulants	caffeine	Stimulant effect
✓	Estrogens and Progestins	oral contraceptives, hormone replacement therapy	Estrogen stimulates hepatic production of angiotensinogen; both appear to contribute in a dose-dependent fashion
✓	Dietary Supplements	ginseng, natural licorice, yohimbine	Mild stimulant effect; increase arterial pressure
✓	Serotonin-norepinephrine Reuptake Inhibitors	venlafaxine, sibutramine	Increase levels of norepinephrine and the subsequent potentiation of noradrenergic neurotransmission
✓	Immunosuppressants	cyclosporine, tacrolimus	Increase prostaglandin synthesis and decrease water, sodium, and potassium excretion





## Assessment of Patients with Documented Hypertension

### ASSESS LIFESTYLE AND CARDIOVASCULAR RISK FACTORS



1. Cigarette smoking
2. Oxidative stress - Organic acid test (CIM Module 15 - Energy Metabolism and Disorders of Aberrant Energy Production)
3. Autoimmune dysfunction - "Innate and adaptive immune responses are linked to hypertension and hypertension - induced CVD through at least three mechanisms: Cytokine production, central nervous system stimulation, and renal damage."<sup>viii</sup> (CIM Module 24 - Integrative Immunology)
4. Diet (CIM Module 14 - Integrative Cardiology)
5. Environmental toxin exposure (especially Heavy metal toxicity: Pb, Cd, and/or Hg) (CIM Module 23 - Environmental Disease and Detoxification)
6. Obesity (BMI  $\geq 30$  kg/m<sup>2</sup>)
7. Physical inactivity
8. Dyslipidemia - Advanced Lipid Panel (CIM Module 14 - Integrative Cardiology)
9. Diabetes mellitus - fasting glucose, HbA1c (CIM Module 17- Insulin Resistance Continuum and Diabetes)
10. Renal disease: check urine for microalbuminuria or GFR  $< 60$  mL/min
11. Elevated uric acid levels (CIM Module 19 - Clinical Laboratory Medicine)
12. Age (men  $> 55$ ; women  $> 65$ ) Family history of premature cardiovascular disease (men  $< 55$ ; women  $< 65$ )



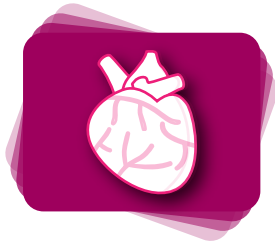
## Assess for secondary causes

1. Sleep apnea - Sudden drops in blood-oxygen levels occurring during sleep apnea increases blood pressure
2. Drug-induced or related causes
3. Chronic kidney disease
4. Primary aldosteronism
5. Renovascular disease
6. Chronic steroid therapy (Cushing's syndrome)
7. Pheochromocytoma
8. Coarctation of the aorta
9. Thyroid or parathyroid disease

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## Heart

1. Left ventricular hypertrophy
2. Angina or prior myocardial infarction
3. Prior coronary revascularization
4. Heart failure

## Target Organ Damage



## Cerebrovascular - stroke or transient ischemic attack

1. Chronic kidney disease
2. Peripheral arterial disease
3. Retinopathy



## Natural Antihypertensive Compounds<sup>viii</sup>

	THERAPEUTIC CLASS	FUNCTIONAL FOOD	NUTRACEUTICAL
✓	ACE Inhibitors	Egg yolk, fish (bonito, dried salted fish, fish sauce, sardines, tuna), garlic, gelatin, hawthorne berry, milk products (casein, sour milk, whey - hydrolyzed), sake, sea vegetables (kelp), wheat germ (hydrolyzed), zein (corn protein)	Omega-3, pycnogenol, zinc
✓	Angiotensin Receptor Blockers	Celery, fiber, garlic	CoQ10, gamma - linolenic acid, potassium, resveratrol, vitamin C, B6
✓	Beta Blockers	Hawthorne berry	
✓	Calcium Channel Blockers	Celery, garlic, hawthorne berry	Alpha-lipoic acid, calcium, EPA, DHA, Magnesium, NAC, Omega-3, B6, C, E
✓	Central Alpha Agonists	Celery, fiber, garlic, protein	CoQ10 GLA, potassium, taurine, B6, C, zinc, decrease sodium
✓	Direct Vasodilators	Celery, fiber, garlic, soy, cooking oils with monounsaturated fats	Alpha-lipoic acid, arginine, calcium, flavonoids, magnesium, omega-3, potassium, taurine, C, E
✓	Diuretics	Celery, hawthorne berry, protein	Calcium, CoQ10, fiber, GLA, L-carnitine, magnesium, potassium, taurine, B6, C

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## Combining Food and Nutrients with Medications <sup>ix</sup>

Some nutrient have a synergistic affect with consumed with certain medications.

1. Sesame with beta blockers, diuretics, and nifedipine
2. Pycnogenol with ACEI
3. Lycopene with various antihypertensive medications

4. Alpha-lipoic acid with ACEI
5. Vitamin C with calcium channel blockers
6. N-acetyl cysteine with arginine
7. Garlic with ACEI, diuretics, and beta blockers
8. Coenzyme Q10 with ACEI and CCB

## Recommendations for Hypertension <sup>x - xi - xii</sup>

✓ Modified Mediterranean diet	<ul style="list-style-type: none"> <li>Incorporating as many functional foods as possible from the table above. (Celery: 4 stalks or celery seed extract -1000 mg x2 or celery oil ½ to 1 teaspoon three x3)</li> </ul>
✓ Exercise prescription	<ul style="list-style-type: none"> <li>(See Module 14 - Integrative Cardiology)</li> </ul>
✓ Mind-body/ stress reduction	<ul style="list-style-type: none"> <li>(See Module 14 - Integrative Cardiology)</li> </ul>
✓ Manipulative Medicine Considerations	<ul style="list-style-type: none"> <li>Normalized ANS (See Module 14 - Integrative Cardiology)</li> </ul>
✓ Omega-3, Omega-6 (GLA), Omega-9	<ul style="list-style-type: none"> <li>Prescribe per RBC-fatty acid analysis or 3-4 grams of EPA-DHA and 1 gram GLA</li> </ul>
✓ Magnesium	<ul style="list-style-type: none"> <li>400 - 800 mg</li> </ul>
✓ Vitamin D	<ul style="list-style-type: none"> <li>2000 IU</li> </ul>
✓ B-complex with extra B6	<ul style="list-style-type: none"> <li>B6 - 100 mg x2</li> </ul>
✓ Vitamin C	<ul style="list-style-type: none"> <li>250 - 500 mg x2</li> </ul>
✓ Arginine	<ul style="list-style-type: none"> <li>5 grams x2</li> </ul>
✓ Hawthorne (if needed)	<ul style="list-style-type: none"> <li>1000 to 1500 mg x2</li> </ul>
✓ CoQ10	<ul style="list-style-type: none"> <li>100 mg x2</li> </ul>
✓ Nattokinase (if need)	<ul style="list-style-type: none"> <li>50 - 100 mg</li> </ul>
✓ Garlic (if not in diet)	<ul style="list-style-type: none"> <li>1000 mg</li> </ul>

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## End Notes

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- i Houston M. Hypertension: Nutrition, Nutraceutical, Vitamins, Antioxidants, and Minerals in Prevention and Treatment. In: Kohlstadt I, editor. 2<sup>nd</sup> Ed. Advancing Medicine with Food and Nutrients. Boca Raton Fla; CRC Press: 2013. p. 105.*
- ii Altas SA. The renin-angiotensin aldosterone system: pathophysiological and pharmacologic inhibition. J Manag Care Pharm. 2007 Oct (SupplB):9-20.*
- iii Uehara Y, Miura S, Yahiro E, Saku K. Non-ACE pathway-induced angiotensin II production. Curr Pharm Des. 2013; 19(17): 3054 - 9.*
- iv Pacurari M, Kafoury R, Tchounwou PB, Ndebele K. The renin-angiotensin-aldosterone system in vascular inflammation and remodeling. Volume 2014; article ID 689360.*
- v Ibid.*
- vi U.S. Pharmacist. Drug-induced Hypertension. [www.uspharmacist.com](http://www.uspharmacist.com)*
- vii Houston M. Hypertension: Nutrition, Nutraceutical, Vitamins, Antioxidants, and Minerals in Prevention and Treatment. In: Kohlstadt I, editor. 2<sup>nd</sup> Ed. Advancing Medicine with Food and Nutrients. Boca Raton Fla; CRC Press: 2013. p. 108.*
- viii Ibid. p. 109.*
- ix Ibid. p. 121.*
- x Gaby AR. Nutritional Medicine. Concord: Fritz Perlberg Publishing; 2011. p. 331.*
- xi Houston M. Hypertension: Nutrition, Nutraceutical, Vitamins, Antioxidants, and Minerals in Prevention and Treatment. In: Kohlstadt I, editor. 2<sup>nd</sup> Ed. Advancing Medicine with Food and Nutrients. Boca Raton Fla; CRC Press: 2013. p. 122-123.*
- xii Sinatra ST, Houston MC. The Integrative Approach to Hypertension. In: Devries S, Dalen JE, editors. Integrative Cardiology; Oxford: Oxford University Press. 2011. p. 224- 241.*